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ABSTRACT

This report presents the results of a survey to ascertain the extent of computer use in Canadian education. Of 307 administrative units responding to the questionnaire, 83 indicated they used electronic data processing services. Business management services accounted for most of the computer use, while administrative and instructional services made from moderate to little use. Plans for future use of computer services indicate that business and administrative management will comprise an increased output. Provincial departments of education also plan increased use of electronic data processing in business management. (RA)

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Electronic Data Processing in Canadian Elementary-Secondary Education

RESEARCH AND PLANNING

Manitoba Department of Youth and Education

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ELECTRONIC DATA PROCESSING IN CANADIAN ELEMENTARY-SECONDARY EDUCATION

by

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and

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This is an adaptation of a paper presented at *The Promised Land of the Computer*, York University, May 11-13, 1970.

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I. INTRODUCTION

It has been frequently and justifiably stated that contemporary technology has extremely high potential for the improvement of education. Despite this high potential, however, educational organizations have, by and large, been slow to adopt the equipment and techniques of our technological age. Many reasons have been offered as explanation for the apparent reluctance of education to utilize audio-visual and computer technology. It is not the purpose of this paper, however, to follow this lead. Rather, the intent is to report the findings of a study conducted within the first four months of 1970 on the extent of computer use in Canadian education.

1. The Study

(a) Purpose. The general purpose of the study was to monitor the current use of Electronic Data Processing (EDP) in Canadian education.

(b) Delimitations. To achieve this purpose to the fullest extent would have required a study much larger than the time or resources available permitted. Therefore, the task was delimited in a number of ways.

i) The survey focussed on the two levels of administration primarily involved in the provision of educational services, provincial Departments of Education and local administrative units (districts, counties, or divisions).

ii) No attempt was made to obtain data on any of Canada's schools or universities.

iii) Similarly, no information was sought on the cost of data processing or computer services or on the manufacturer or distributor of the services, if in the private sector.

These latter two delimitations were significant but necessary omissions.

(c) Dimensions. The versatility of the computer is something which gives it a very high potential for utilization in education. However, this same versatility is the characteristic which makes the study of computer services in education an extremely complex and dynamic field. To make it possible to obtain and interpret information on these services, the field of study was mapped along two major dimensions.

i) The System Elements. The information gathered within this dimension attempted to delineate the input and output of the data processing or computer system within the organization. Figure I indicates that the major elements of input considered were equipment and personnel. Equipment was sub-divided into unit record or computer, and personnel was categorized in terms of position into director or coordinator,

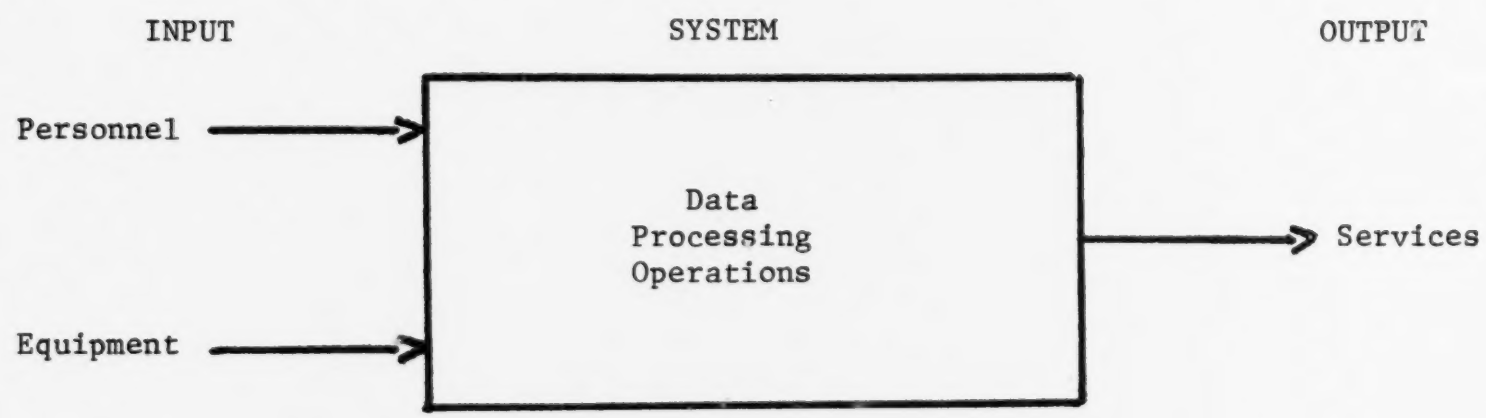

FIGURE I

AN EDP SYSTEM MODEL

systems analyst or consultant, programmer or coder, and keypunch or machine operator.

The major elements of output of the system delineated, were operations or services provided. The services identified were: business management--those services primarily related to financial accounting; educational management--those services primarily related to administration of the educational organization at the school, district or provincial levels; instructional management--those services primarily related to the educational process at the classroom level; and other services--those services not clearly identifiable in the preceding three categories.

ii) Stages of Development. The second major dimension of analysis was examination of the EDP system with respect to time. Three stages of system development were defined.

Planning. This was the stage where the identification of needed services--personnel and equipment--had been made, but no funds had yet been expended or committed specifically for educational data processing.

Developing. This was the stage where funds had been committed or were being spent on technical personnel (such as consultants, analysts or programmers) and equipment was being used, but no regular output was being produced.

Operating. This was the stage where the system was performing EDP operations or services which resulted in the production of reports or documents on a regular basis.

2. Earlier Research

In the planning of this study a number of previous surveys on data processing in education proved invaluable. By far the most comprehensive of these earlier studies examined data processing in the great cities of the United States.[1] The concepts and design of this study were instrumental in the early stages of development of the study herein reported.

Perhaps more relevant, however, were studies conducted over the past five years in Canada. While several studies within individual provinces of Canada had been conducted, the first attempt at a Canada-wide study of data processing in education was completed by Hemphill in 1966.[2] The main focus of that study was to analyze the adoption of automatic data processing by comparison of adopter and non-adopter school districts. The techniques and scope of that initial study were subsequently refined by Wallin in 1968[3] and Pallesen in 1969.[4]

The study reported here is a further attempt to refine our knowledge of the status of data processing utilization in Canadian education.

II. SURVEY PROCEDURES

When carrying out survey research, the researcher must plan his study taking into account the vagaries associated with voluntary participation of the population being surveyed. The instrument and procedures used in this study were designed to elicit immediate and valid responses from a large percentage of the population being surveyed.

1. The Questionnaires

Questionnaires were developed in English and French for the local administrative units and in English for the provincial departments of education.* The checklist format was decided upon for *ease of response* reasons, and with full realization that much detailed information would be lost as a *trade-off* to response facility.

2. Distribution and Collection Procedures

Canada's geography militated against any one office, even one as central as Winnipeg, being able to establish the contacts necessary for a high percentage of questionnaire return. Therefore, it was decided that an individual in each of the ten provinces would be asked to act as local agent for distribution and collection of the questionnaires. Gratifying cooperation was received from these agents located in the provincial Departments of Education, universities and research institutes.

Table I indicates the local administrative unit distribution and return of questionnaires in the eight participating provinces. (Prince Edward Island and Quebec declined participation in the project.) The responses by province ranged from approximately 43 to 93 per cent, with an eight province average of 72 per cent.

3. Data Analysis

The nature of the information sought and the questionnaires distributed dictated data analysis procedures which were basically tally and tabulation, rather than comparison and analysis. These procedures, therefore, produced descriptive rather than inferential statistics.

III. THE FINDINGS

The purpose of this section is to examine in some detail, the input and output of the current and future data processing systems at both the local administrative unit and provincial department levels.

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* Copies of the questionnaires are available on request from the authors.

TABLE I

QUESTIONNAIRE DISTRIBUTION AND PERCENTAGE RETURNED, BY PROVINCE

Province	No. of Questionnaires Distributed	No. of Questionnaires Returned	Percentage Returned
B.C.	60	47	78.3
Alberta	80	63	78.7
Saskatchewan	68	62	91.2
Manitoba	41	38	92.7
Ontario	60	34	56.6
New Brunswick	42	18	42.8
Nova Scotia	34	25	73.5
Newfoundland	40	20	50.0
Total	425	307	72.2

1. Local Administrative Units

(a) In operation. Tables II to V indicate the extent of local unit data processing services by province.

Table II shows use of financial accounting services, especially payroll, to be the most frequently used business management operations. Data processing of payroll is used in 74 of the responding local units. Ontario and British Columbia lead the way in aggregate use of EDP for business management.

Use of EDP in educational management services, as presented in Table III, takes a similar pattern. However, in this area, Ontario is well ahead of British Columbia in total utilization. As may be expected, the most frequently used educational management services are student scheduling, with 54 units, and test scoring and student achievement, with 37 and 32 units respectively reporting use.

As demonstrated by Tables IV and V, EDP output in the form of instructional management and other services are far less extensively used than are business and educational management services. Nevertheless, a number of local administrative units are utilizing EDP in the area of test development and research.

To provide the output in services indicated in the above Tables, an input of men and machines is necessary. Tables VI and VII describe this input.

There are a number of interesting aspects to the picture of EDP personnel presented in Table VI. First, well over half the units reported use of EDP personnel located in their own central offices, and the largest proportion of these was of the keypunch and machine operator type. Second, fewer than one-third of the units reported use of service bureau or university personnel. Finally, less than one-seventh of the units reporting used provincial government personnel. To the extent that provincial personnel were used, they were largely of the middle range consultant, analyst or programmer type.

With regard to equipment use, Table VII indicates approximately equal use of local and service bureau hardware. However, the tendency appears to be to use externally controlled, more than locally controlled computer equipment. As with personnel, there is quite limited use of provincial hardware of either the unit record or computer type.

In summary, then, the current state of EDP systems in local administrative units in Canada is characterized by:

i) input of human and hardware resources fairly well divided between local unit and service bureau or university,

ii) very limited input of equipment or personnel from provincial governments,

TABLE II

LOCAL ADMINISTRATIVE UNITS OPERATING EDP BUSINESS MANAGEMENT SERVICES, BY PROVINCE

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Payroll (e.g. payroll deduction, cheque printing, etc.)	20	10	4	12	23	3	1	1	74
2. Voucher Accounting (e.g. accounts payable, purchase orders requisitioning.)	15	7		6	15	1			44
3. Cash Receipts and Receivables	12	8		7	11			1	39
4. Appropriation and Expenditure Accounting.	11	7		6	14	1			39
5. Budget Analysis and Control (e.g. cost analysis, budget preparation	12	6		4	12	1			35
6. Inventory Control (e.g. capital, supplies, equipment, warehouse)	2	2		1	6				11
7. General Ledger and Subsidiary Ledgers	9	8	1	6	9	1			34

TABLE II (continued)

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
8. Administrative and Statistical Reports	8	4		1	12				25
9. Transportation (e.g. routes, scheduling, bus maintenance records.)		1			2		1		4
10. School and Equipment Maintenance Records					2		1		3
11. Building Reports for School Building Planning		1							1
12. Population and Census Data	1	1		1	2		1		6
Total	90	55	5	44	108	7	4	2	315

TABLE III

LOCAL ADMINISTRATIVE UNITS OPERATING EDP EDUCATIONAL MANAGEMENT SERVICES, BY PROVINCE

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Scheduling (e.g.students, teachers, classes)	21	5	3	3	21	1			54
2. Test Scoring and Analysis	8	4	4	1	18		2		37
3. Student Marks and Reports	4	2	5	5	16				32
4. Grade distribution	5	1	3	2	10				21
5. Enrollment and Attendance Records	4	1	2	1	12				20
6. Pupil Registration	5	3	2	1	12				23
7. Pupil Cumulative Records	4		2		5		1		12
8. Substitute Teacher Placement					2				2
9. Teaching Personnel Records	1	1			7				9
10. Medical Data System					2				2
Total	52	17	21	13	105	1	3		212

TABLE IV

LOCAL ADMINISTRATIVE UNITS OPERATING EDP INSTRUCTIONAL MANAGEMENT SERVICES, BY PROVINCE

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Test Services (e.g. tests and test items)	3	2	2		12				19
2. Library Services (e.g. book lending, requisitioning, etc.)					1				1
3. Film Library Services	1				3				4
4. Filmstrip Library Services	1				3				4
5. Microfilm Library Services					1				1
6. Microfiche Library Services									
7. Teaching Aids Service									
Total	5	2	2		20				29

TABLE V

LOCAL ADMINISTRATIVE UNITS OPERATING
OTHER EDP SERVICES, BY PROVINCE

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Simulations (e.g.space construction, building site selection, study programs)		1			1				2
2. Research		2	1	1	4				8
3. Information System									
(a) Pupil data bank		1	1		2				4
(b) Personnel data bank		1			3				4
(c) Program data bank					2				2
(d) Finance data bank					3				3
(e) Facilities data bank					1				1
4. Others	1	1			7				9
Total	1	6	2	1	23				33

TABLE VI

LOCAL ADMINISTRATIVE UNITS EMPLOYING EDP PERSONNEL, BY TYPE AND PROVINCE

Personnel	Province[a]								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Coordinator or Director									
a. In local office		2	1	1	12	1		1	18
b. In prov. gov't.		1			2				3
c. In service bureau, University or other				1	2	1			4
2. Systems analyst or Consultant									
a. In local office	2			1	12		1	1	17
b. In prov. gov't.	2				3				5
c. In service bureau, University or other	2	2		1	4	1			10
3. Programmer or Coder									
a. In local office	2	2			12	1		1	18
b. In prov. gov't.	2			1	4				7
c. In service bureau, University or other	3	2		2	5	1			13

[a]Comparable data not available

TABLE VI (continued)

Personnel	Province								Total
	B.C.[a]	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
4. Keypunch or Machine Operator									
a. In local office		2	3	3	15	1		1	25
b. In prov. gov't.		1			2				3
c. In service bureau, University or other		1	1	3	7	1			13

Total local	78
Total provincial	18
Total service bureau	40
Total	136

[a]Comparable data not available

TABLE VII

LOCAL ADMINISTRATIVE UNITS USING EDP EQUIPMENT, BY TYPE AND PROVINCE

Equipment	Province[a] B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	Total
1. Unit Record									
a. In local office		1	2	3	8			1	15
b. In prov. gov't.		2		1	3		1	1	8
c. In service bureau, University or other		3	1	2	6	1	1	1	15
2. Computer									
a. In local office	2	1	1	14	1		2	21	
b. In prov. gov't.	3		1	2			1		7
c. In service bureau, University or other	7	5	6	8	1		1		28
3. Terminals in schools	1		1	1			1	4	

Total local	40
Total provincial	15
Total service bureau	43
Total	98

[a]Comparable data not available

iii) major output of services in the area of business management, particularly in payroll and financial accounting operations, and

iv) major output of services in educational management, primarily in the area of student scheduling, testing and reporting procedures.

(b) Developing

The form of the survey instrument provided the opportunity for the local units to indicate the areas in which they were developing EDP procedures. Information on this intermediate stage of development is presented in Tables VIII to XI.

Table VIII indicates that the major development in business management services is taking place in Ontario. Furthermore, this development is in the areas of financial accounting, largely excluding payroll. Presumably, EDP payroll procedures require little further development.

In aggregate, there appears to be more development taking place in educational than in business management. Table IX shows that development is well distributed throughout the educational management services, with the exception of substitute teacher and medical data operations. In addition to Ontario, both Alberta and British Columbia are significantly involved in this area of development.

The data presented in Table X indicate very limited development in the area of instructional management services. Slightly more development is taking place in other services, especially in Ontario. Table XI also indicates that development of *information systems* is receiving some attention.

It should be noted that while services are being developed, currently available personnel and equipment must be utilized. Thus, while one may conceive of developing personnel and hardware, no information on this phase was elicited from the survey participants. One may conclude, however, that the proportion of personnel and equipment being used for development purposes is considerably smaller than the actual operational use.

(c) Planned

The anticipated input and output of local administrative unit EDP systems is displayed in Tables XII to XVII.

Perhaps the most notable feature of Table XII is the consistency of planned output in business management with respect to the specific services. Even areas such as transportation, equipment, and building procedures are seen as potential areas for EDP use. There is a similar consistency of expected output in the business management area across the five westernmost provinces.

TABLE VIII

LOCAL ADMINISTRATIVE UNITS DEVELOPING EDP BUSINESS MANAGEMENT SERVICES, BY PROVINCE

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Payroll (e.g. payroll deduction, cheque printing, etc.)	1	2			3				6
2. Voucher Accounting (e.g. accounts payable, purchase orders requisitioning.)	2				6			1	9
3. Cash Receipts and Receivables	1	1	1		4				7
4. Appropriation and Expenditure Accounting	1		1		5			1	8
5. Budget Analysis and Control (e.g. cost analysis, budget preparation.)	1	1	1		3				6
6. Inventory Control (e.g. capital, supplies, equipment, warehouse)		1							1
7. General Ledger and Subsidiary ledgers	1				4				5

TABLE VIII (continued)

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
8. Administrative and Statistical Reports	1	1	1		5				8
9. Transportation (e.g. routes, scheduling, bus maintenance records.)					2	1			3
10. School and Equipment Maintenance Records		1		1	3				5
11. Building Reports for School Building Planning		1		2					3
12. Population and Census Data		1		1	3				5
Total	8	9	4	4	38	1		2	66

TABLE IX

LOCAL ADMINISTRATIVE UNITS DEVELOPING EDP EDUCATIONAL MANAGEMENT SERVICES, BY PROVINCE

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Scheduling (e.g. students, teachers, classes)	2	2		2	8	1			15
2. Test Scoring and Analysis	1	4	1		2				8
3. Student Marks and Reports	3	2		2	3	1			11
4. Grade distribution		1			5	1			7
5. Enrollment and Attendance Records	1	1		1	4	1			8
6. Pupil Registration	1	1	1		3	1			7
7. Pupil Cumulative Records	2	1	1		5				9
8. Substitute Teacher Placement					1				1
9. Teaching Personnel Records	3				8				11
10. Medical Data System					1				1
Total	13	12	3	5	40	5			78

TABLE X

LOCAL ADMINISTRATIVE UNITS DEVELOPING EDP INSTRUCTIONAL MANAGEMENT SERVICES, BY PROVINCE

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Test Services (e.g. tests and test items)	1	3	1	1					6
2. Library Services (e.g. book lending, requisitioning, etc.)					3				3
3. Film Library Services	1	2			1				4
4. Filmstrip Library Services	1	1			1				3
5. Microfilm Library Services									
6. Microfiche Library Services									
7. Teaching Aids Service	1				1				2
Total	4	6	1	1	6				18

TABLE XI

LOCAL ADMINISTRATIVE UNITS DEVELOPING
OTHER EDP SERVICES, BY PROVINCE

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Simulations (e.g. space construction, building site selection, study programs)									
2. Research	1				2				3
3. Information System									
(a) Pupil data bank	3				3				6
(b) Personnel data bank	3				5				8
(c) Program data bank					2				2
(d) Finance data bank					4				4
(e) Facilities data bank				1	2				3
4. Others	1	1							2
Total	8	1		1	18				28

TABLE XII

LOCAL ADMINISTRATIVE UNITS PLANNING EDP BUSINESS MANAGEMENT SERVICES, BY PROVINCE

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Payroll (e.g. payroll deduction, cheque printing, etc.)	3	5	5	8	6				27
2. Voucher Accounting (e.g. accounts payable, purchase orders requisition.)	6	5	6	7	9				33
3. Cash Receipts and Receivables	6	3	5	7	8				29
4. Appropriation and Expenditure Accounting	5	3	4	7	8			1	28
5. Budget Analysis and Control (e.g. cost analysis, budget preparation)	6	4	6	8	11			2	37
6. Inventory Control (e.g. capital, supplies, equipment, warehouse)	5	4		5	19			1	34
7. General Ledger and Subsidiary Ledgers	5	5	5	6	11			1	33

TABLE XII (continued)

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
8. Administrative and Statistical Reports	6	3	7	6	8			2	32
9. Transportation (e.g. routes, scheduling, bus maintenance records)	1	2	2	3	4			1	13
10. School and Equipment Maintenance Records	4	5		3	10			1	23
11. Building Reports for School Building Planning	3	2	2	2	4			1	14
12. Population and Census Data	5	1	2	2	7				17
Total	55	42	44	64	105			10	320

The planning for educational management services lacks both the magnitude and consistency extant in business management. Table XIII indicates that Alberta, British Columbia and Manitoba are planning EDP output in educational management of a similar magnitude to that in Ontario. This planning remains basically in the pupil accounting areas of scheduling, testing and enrollment.

Tables XIV and XV indicate limited anticipation of EDP services in instructional management and other areas. Planning in Ontario, Alberta and Manitoba focusses on testing and library services, as well as on information system services.

Contrary to the current personnel input, Table XVI indicates that local units anticipate use of provincial and local personnel, more than service bureau or university people. This trend is not reflected in the planned use of equipment. Table XVII, rather, suggest that hardware in provincial governments and service bureaus will be used more extensively than equipment located in the school unit.

If these data are an accurate forecast, then EDP operations of local school units, in the immediate future, will be characterized by:

i) business management services expansion into provinces not now greatly involved and utilization of EDP in currently limited-use areas such as transportation, equipment, and building records,

ii) similar expansion in educational and instructional management output, as well as information systems,

iii) a shift of personnel input from highly local to local and provincial government, and

iv) a change in hardware usage from local and service bureau to provincial and service bureau.

These trends are evident in Tables XVIII to XX which present summaries of the data described above.

2. Provincial Departments of Education

All ten provincial Departments of Education returned questionnaires. Because of the small number of respondents, Tables XXI to XXVI present only summaries of provincial department EDP systems.

Table XXI indicates four provinces currently offering expenditure accounting, five statistical reports and seven providing payroll services in business management output. The major areas under development are budget analysis and statistical reports, while five provinces are planning to handle aspects of transportation through EDP. It is interesting to note that significantly more output services are being developed than are currently being planned.

TABLE XIII

LOCAL ADMINISTRATIVE UNITS PLANNING EDP EDUCATIONAL MANAGEMENT SERVICES, BY PROVINCE

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Scheduling (e.g. students, teachers, classes)	5	7	4	8	2	3	2		31
2. Test Scoring and Analysis	2	4	4	6	4	1			21
3. Student Marks and Reports	8	5	1	3	5	3			25
4. Grade distribution	3	2	1	2	5				13
5. Enrollment and Attendance Records	7	6	2	2	4	1			22
6. Pupil Registration	4	6	1	3	4				18
7. Pupil Cumulative Records	2	4	1	2	5	1			15
8. Substitute Teacher Placement		2		2	2				6
9. Teaching Personnel Records	1	4	1	3	6				15
10. Medical Data System	1	1		2	2				6
Total	33	41	15	33	39	9	2		172

TABLE XIV

LOCAL ADMINISTRATIVE UNITS PLANNING EDP INSTRUCTIONAL MANAGEMENT SERVICES, BY PROVINCE

Service	Province								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Test Services (e.g. tests and test items)	3	3	5	2	1				14
2. Library Services (e.g. book lending, requisitioning, etc.)	2	4	1	3	5				15
3. Film Library Services	1	2		2	6				11
4. Filmstrip Library Services	1	2		2	5				10
5. Microfilm Library Services	1	1		1					3
6. Microfiche Library Services		1		1					2
7. Teaching Aids Service	1	2	1	3	1				8
Total	9	15	7	14	18				63

TABLE XV

LOCAL ADMINISTRATIVE UNITS PLANNING
OTHER EDP SERVICES, BY PROVINCE

Service	Province								Total
	B.C.	Alta	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Simulations (e.g. space construction, building site selection, study programs)	1	1		1	1				5
2. Research		1		2	2				5
3. Information System									
(a) Pupil data bank		3		4	3				10
(b) Personnel data bank		2		3	5				10
(c) Program data bank	2	2		3	3				10
(d) Finance data bank	2	2		3	4				11
(e) Facilities data bank	1	2		2	4				9
4. Others					1				1
Total	6	13		19	23				61

TABLE XVI

LOCAL ADMINISTRATIVE UNITS PLANNING TO EMPLOY
EDP PERSONNEL, BY TYPE AND PROVINCE

Personnel	Province[a]								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Coordinator or Director									
a. In local office		3		1	2	1			7
b. In prov. gov't.		2	1	2					5
c. In service bureau, University or other			1	3		1			5
2. Systems analyst or Consultant									
a. In local office		2		1	4				7
b. In prov. gov't.		3	1	1	3				8
c. In service bureau, University or other		2	1	2	1	1			7
3. Programmer or Coder									
a. In local office		1		1	3				5
b. In prov. gov't.		2	1	2	1				6
c. In service bureau, University or other		2	1	2					5

[a]Comparable data not available

TABLE XVI (continued)

Personnel	Province								Total
	B.C.[a]	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
4. Keypunch or Machine Operator									
a. In local office		2			5	1			8
b. In prov. gov't.		5	1	2	1				9
c. In service bureau, University or other		2	1	1					4

Total local	27
Total provincial	28
Total service bureau	21
Total	76

[a]Comparable data not available

TABLE XVII

LOCAL ADMINISTRATIVE UNITS PLANNING TO USE
EDP EQUIPMENT, BY TYPE AND PROVINCE

Equipment	Province[a]								Total
	B.C.	Alta.	Sask.	Man.	Ont.	N.B.	N.S.	Nfld.	
1. Unit Record									
a. In local office		3		3	4			1	11
b. In prov. gov't.		6	1	3	3	1		2	16
c. In service bureau, University or other		4	2	3	3	2	1	1	16
2. Computer									
a. In local office		3		1	4			1	9
b. In prov. gov't.		6	2	3	2	3		1	17
c. In service bureau, University or other		7	6	1	4	2		1	21
3. Terminals in schools		1		2	2			1	6

Total local	26
Total provincial	33
Total service bureau	37
Total	96

[a]Comparable data not available

TABLE XVIII

SUMMARY OF LOCAL ADMINISTRATIVE UNITS EDP SERVICES BY STAGE OF DEVELOPMENT

Services	Stage of Development		
	Operational	Developing	Planned
1. Business management	315	66	320
2. Educational management	212	78	172
3. Instructional management	29	18	63
4. Other	33	28	61
Total	589	190	616

TABLE XIX

SUMMARY OF LOCAL ADMINISTRATIVE UNITS EDP
PERSONNEL PRESENT AND FUTURE

Personnel	Stage of Development	
	Employed	Planned
1. Coordinators or Directors	25	17
2. Systems analysts or Consultants	32	22
3. Programmers or Coders	38	16
4. Keypunch or Machine Operators	41	21
Total	136	76

TABLE XX

SUMMARY OF LOCAL ADMINISTRATIVE UNITS EDP
EQUIPMENT PRESENT AND FUTURE

Equipment	Stage of Development	
	In Use	Planned
1. Unit Record	38	43
2. Computer	56	47
3. Terminals in schools	4	6
Total	98	96

TABLE XXI

PROVINCIAL DEPARTMENTS OF EDUCATION EDP BUSINESS MANAGEMENT SERVICES, BY STAGE OF DEVELOPMENT

Service	Stage of Development			Total
	Operating	Development	Planned	
1. Payroll (e.g. payroll deduction, cheque printing, etc.)	7	1	1	9
2. Voucher Accounting (e.g. accounts payable, purchase orders requisitioning.)	3	1	1	5
3. Cash Receipts and Receivables	2		1	3
4. Appropriation and Expenditure Accounting.	4	2	1	7
5.Budget Analysis and Control (e.g. cost analysis, budget preparation.)	3	3	1	7
6. Inventory Control (e.g. capital, supplies, equipment, warehouse)	2	2	2	6
7. General Ledger and Subsidiary Ledgers	2	1	2	5
8. Administrative and Statistical Reports	5	4		9
9. Transportation (e.g. routes, scheduling, bus maintenance records.)		2	5	7
10. School and Equipment Maintenance Records		2	1	3

TABLE XXI (continued)

Service	Stage of Development			Total
	Operating	Developing	Planned	
11. Building Reports for School Building Planning	1	2	1	4
12. Population and Census Data	2			2
Total	31	20	16	67

This same trend is evident in educational management services as well. Table XXII shows current operations largely in test scoring and student marks, with student enrollment, registration and cumulative records being developed, and scheduling the main service being planned.

Almost no instructional management services are in operation, and few are being developed or planned. Evidence of this can be seen in Table XXIII.

There is some development in provincial information systems, however. Table XXIV shows five provinces developing pupil, and three personnel data banks.

In terms of personnel input, approximately twice as much use is made of Department of Education and other provincial department EDP personnel, than of service bureau or university people. Table XXV indicates only three of the Departments of Education reported having their own EDP Coordinator or Director. Comparatively little EDP personnel input increase is anticipated.

Table XXVI shows all ten provincial Departments of Education either using or planning to use unit record equipment in another provincial government department. Four education departments plan to use the computer located in another department and three report currently using their own. The tendency is for Departments of Education to use EDP installations located within the provincial government rather than to go to a service bureau or university.

Provincial Department of Education EDP systems are generally characterized by:

i) more emphasis on development, as compared to operating and planning, than local administrative units, and

ii) focus on input in terms of both personnel and equipment from government rather than private sector sources.

IV. CONCLUSIONS

1. Trends in local administrative unit EDP

(a) Users

The dramatic increase in the number of local administrative units using EDP services is evident from Figure II. During the four year period from 1966 to the present, the number of user districts has increased from 14 to 83. Some of this increase may be due to the difference in survey procedures used in the four studies conducted. Nevertheless, this period has seen at least a five-fold increase in the number of EDP user districts.

Table XXVII indicates that the increase has been largely in the

TABLE XXII

PROVINCIAL DEPARTMENTS OF EDUCATION EDP EDUCATIONAL MANAGEMENT SERVICES, BY STAGE OF DEVELOPMENT

Service	Stage of Development			Total
	Operating	Developing	Planned	
1. Scheduling (e.g. student, teachers, classes)	1	2	4	7
2. Test Scoring and Analysis	6	2	2	10
3. Student Marks and Reports	4	2		6
4. Grade distribution	1			1
5. Enrollment and Attendance Records	2	3	2	7
6. Pupil Registration	3	2	1	6
7. Pupil Cumulative Records	2	3	1	6
8. Substitute Teacher Placement		2		2
9. Teaching Personnel Records	3	2		5
10. Medical Data System	1	1	2	4
Total	23	19	12	54

TABLE XXIII

PROVINCIAL DEPARTMENTS OF EDUCATION EDP INSTRUCTIONAL MANAGEMENT SERVICES, BY STAGE OF DEVELOPMENT

Service	Stage of Development			Total
	Operating	Developing	Planned	
1. Test Services (e.g. tests and test items)	3	1	2	6
2. Library Services (e.g. book lendin g, requisitioning, etc.)		2	2	4
3. Film Library Services		2		2
4. Filmstrip Library Services	1	1		2
5. Microfilm Library Services		1		1
6. Microfiche Library Services		1		1
7. Teaching Aids Service	1	1		2
Total	5	9	4	18

TABLE XXIV

PROVINCIAL DEPARTMENTS OF EDUCATION OTHER EDP SERVICES, BY STAGE OF DEVELOPMENT

Service	Stage of Development			Total
	Operating	Developing	Planned	
1. Simulations (e.g. space construction, building site selection, study programs)		2	2	4
2. Research	2	4	1	7
3. Information System				
(a) Pupil data bank	1	5	1	7
(b) Personnel data bank	1	3	1	5
(c) Program data bank	1	1	1	3
(d) Finance data bank	1	2	2	5
(e) Facilities data bank	1	2	1	4
4. Others	4	2	1	7
Total	11	21	10	42

TABLE XXV

PROVINCIAL DEPARTMENTS OF EDUCATION
EDP PERSONNEL, PRESENT AND FUTURE

Personnel	Stage of Development: Employed	Planned	Total
1. Coordinator or Director			
(a) In Dept. of Ed.	3	1	4
(b) In other gov't dept.			
(c) In service bureau, University, or other			
2. Systems Analyst or Consultant			
(a) In Dept. of Ed.	3	2	5
(b) In other gov't dept.	5	1	6
(c) In service bureau, University, or other	2		2
3. Programmer or Coder			
(a) In Dept. of Ed.	4		4
(b) In other gov't. dept.	5	2	7
(c) In service bureau, University, or other	4		4
4. Keypunch or Machine Operator			
(a) In Dept. of Ed.	5	1	6
(b) In other gov't. dept.	5	1	6
(c) In service bureau, University, or other	5		5

Total Dept. or Ed.	19
Total other prov.dept.	19
Total service bureau	11
Total	49

TABLE XXVI

PROVINCIAL DEPARTMENTS OF EDUCATION
EDP EQUIPMENT, PRESENT AND FUTURE

Equipment	Stage of Development		Total
	In Use	Planned	
1. Unit record			
(a) Dept. of Ed.	3	1	4
(b) Other gov't. dept.	4	6	10
(c) Service bureau	2	1	3
2. Computer			
(a) Dept. of Ed.	3		3
(b) Other gov't. dept.	2	4	6
(c) Service bureau	3	2	5
3. (a) Regional centers		2	2
(b) Terminals	1	3	4
Total Dept. of Ed.			13
Total other gov't. dept.			16
Total service bureau			8
Total			37

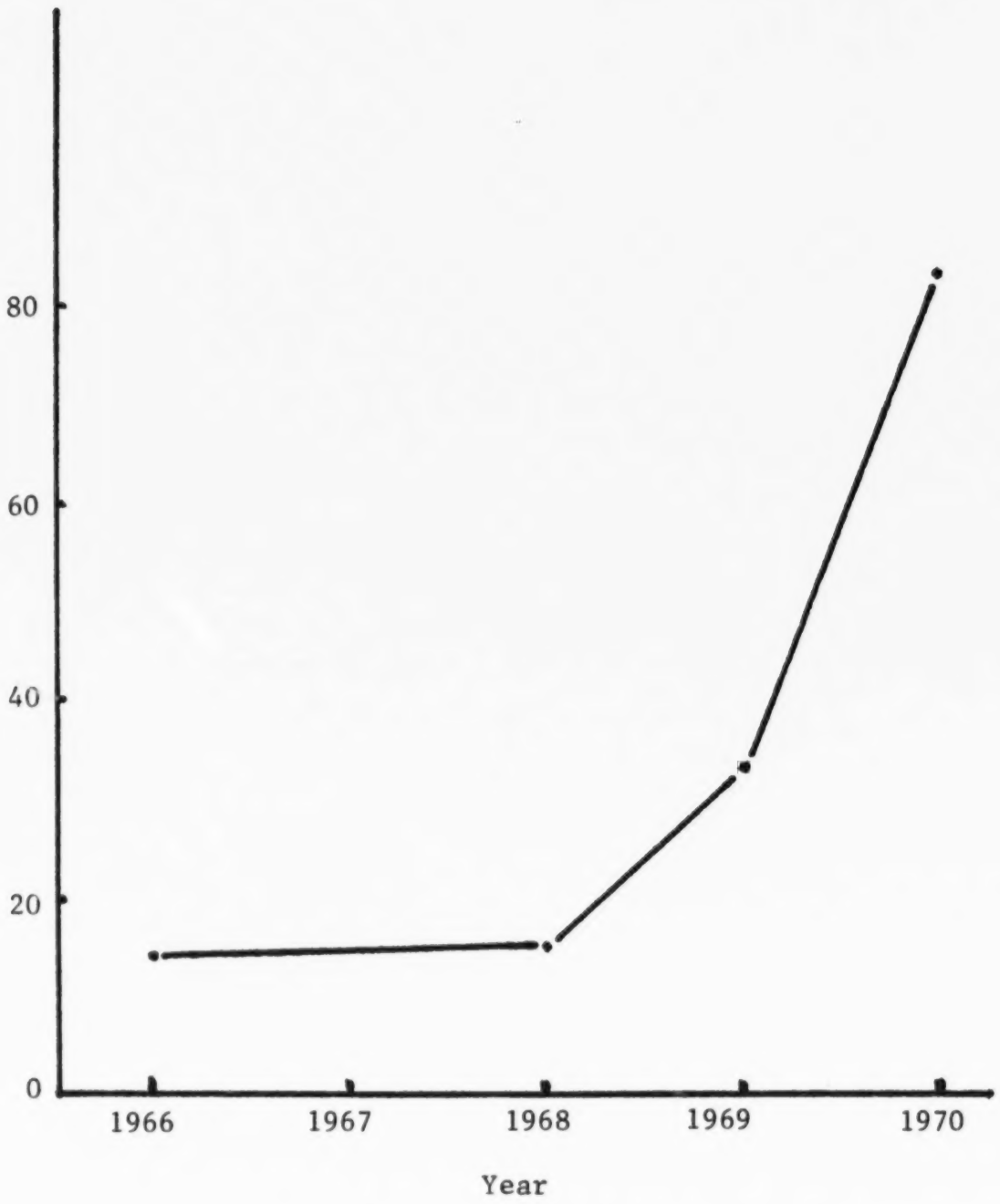

FIGURE II

INCREASE IN NUMBER OF LOCAL ADMINISTRATIVE
UNITS USING EDP

TABLE XXVII

INCREASE IN NUMBER OF LOCAL ADMINISTRATIVE UNITS USING EDP, BY SIZE

Unit Enrollment	Number of Users		
	1966[a]	1969[b]	1970
Fewer than 10,000	3	4	40
10,001 - 25,000	2	8	21
25,001 - 50,000	2	13	15
50,001 - 100,000	6	5	5
More than 100,000	1	3	2
Total	14	33	83

[a]Hemphill, op.cit.

[b]Pallesen, op.cit.

small and intermediate size units with enrollment of fewer than 25,000 students. This exponential growth is no doubt a function of the availability of payroll and voucher accounting *packages* provided by banks and recently established EDP service centers. These packages provide frequent, accurate and relatively inexpensive accounting procedures for even the smallest school units.

Data from the current study, displayed in Table XXVIII, indicate that almost all districts of more than 25,000 enrollment are using EDP for one or more operations. This suggests that the major part of the increase in the number of users will take place in the reservoir of districts with enrollment of fewer than 25,000.

(b) Output

The next question to be answered is *What types of services will comprise this increased output?* This question is partially answered by Figure III. This figure indicates, first of all, that the planned use of EDP output is greater than that currently being used, and significantly greater than that which is currently being developed. Secondly, there is an increase in the planned use of EDP for business management services. This is complemented by a decrease in the expectation of EDP services in instructional management. The proportion of educational management and other services will remain fairly constant.

Figure IV reaffirms the small and intermediate size school units as those where EDP output will greatly increase and also indicates that this increase will be primarily in business and educational management services.

(c) Input

The magnitude of planned EDP output is not matched with personnel input. As indicated in Figure III, there is greater than 100 per cent expansion planned in EDP services. However, Figure V shows only 56 per cent expansion in planned personnel. There is also a clearly demonstrated shift from current local to future provincial personnel input.

Increase in equipment input of almost 100 per cent is expected, with the proportion of provincial input increasing in a manner similar to that of personnel.

2. Trends in provincial Departments of Education EDP

The small number of provincial Departments of Education reporting did not provide a sufficiently large sample for as detailed a description as did the number of local administrative units. However, a number of trends are suggested.

TABLE XXVIII

LOCAL ADMINISTRATIVE UNITS USING EDP AS A PERCENTAGE OF THOSE RESPONDING, BY SIZE

Total Student Enrollment	No. of Units		Percentage Users
	Non-users	Users	
Fewer than 10,000	210	40	16.0
10,001 - 25,000	12	21	63.6
25,001 - 50,000	2	15	88.3
50,001 - 100,000	-	5	100.0
More than 100,000	-	2	100.0
Total	224	83	27.0

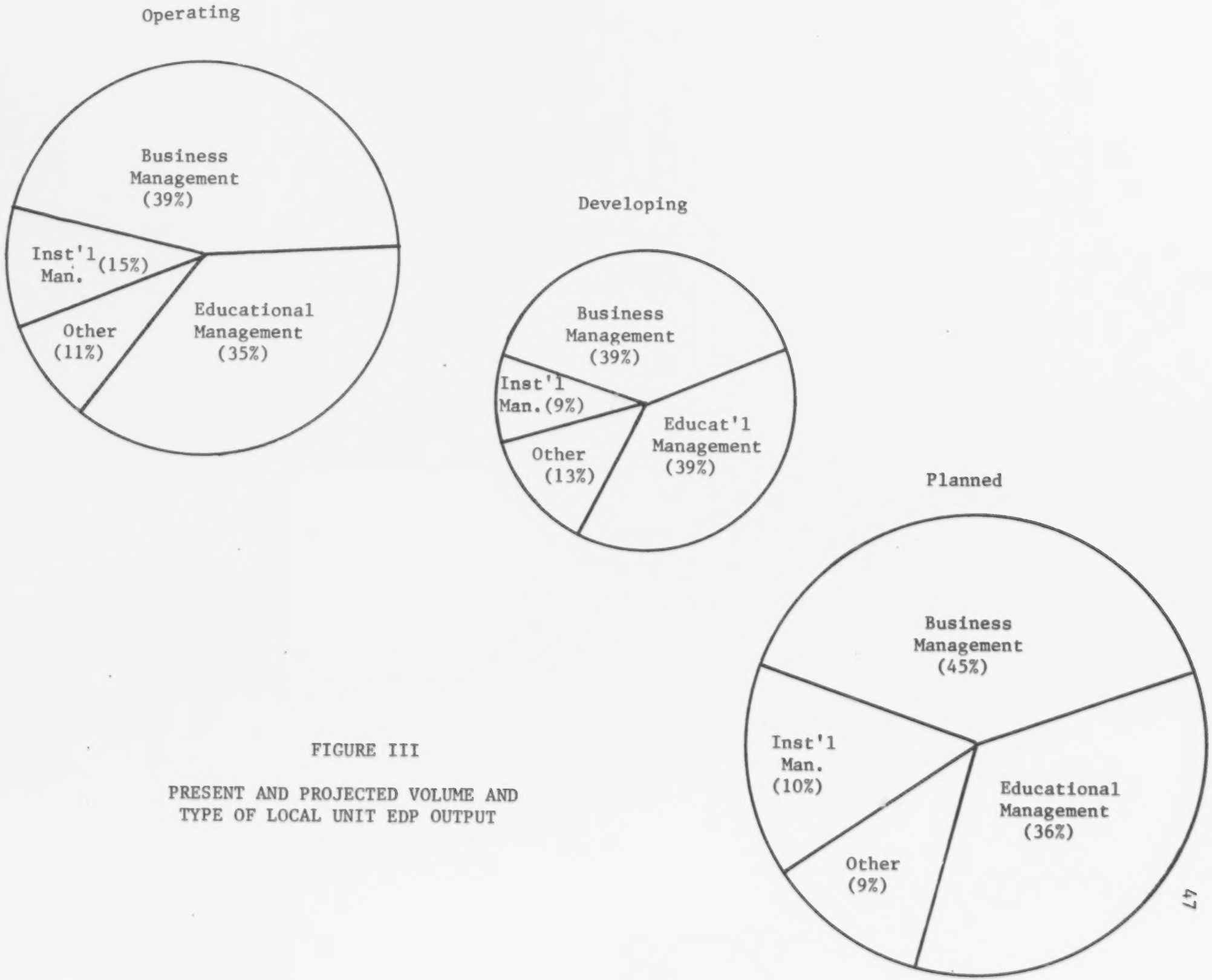

FIGURE III

PRESENT AND PROJECTED VOLUME AND TYPE OF LOCAL UNIT EDP OUTPUT

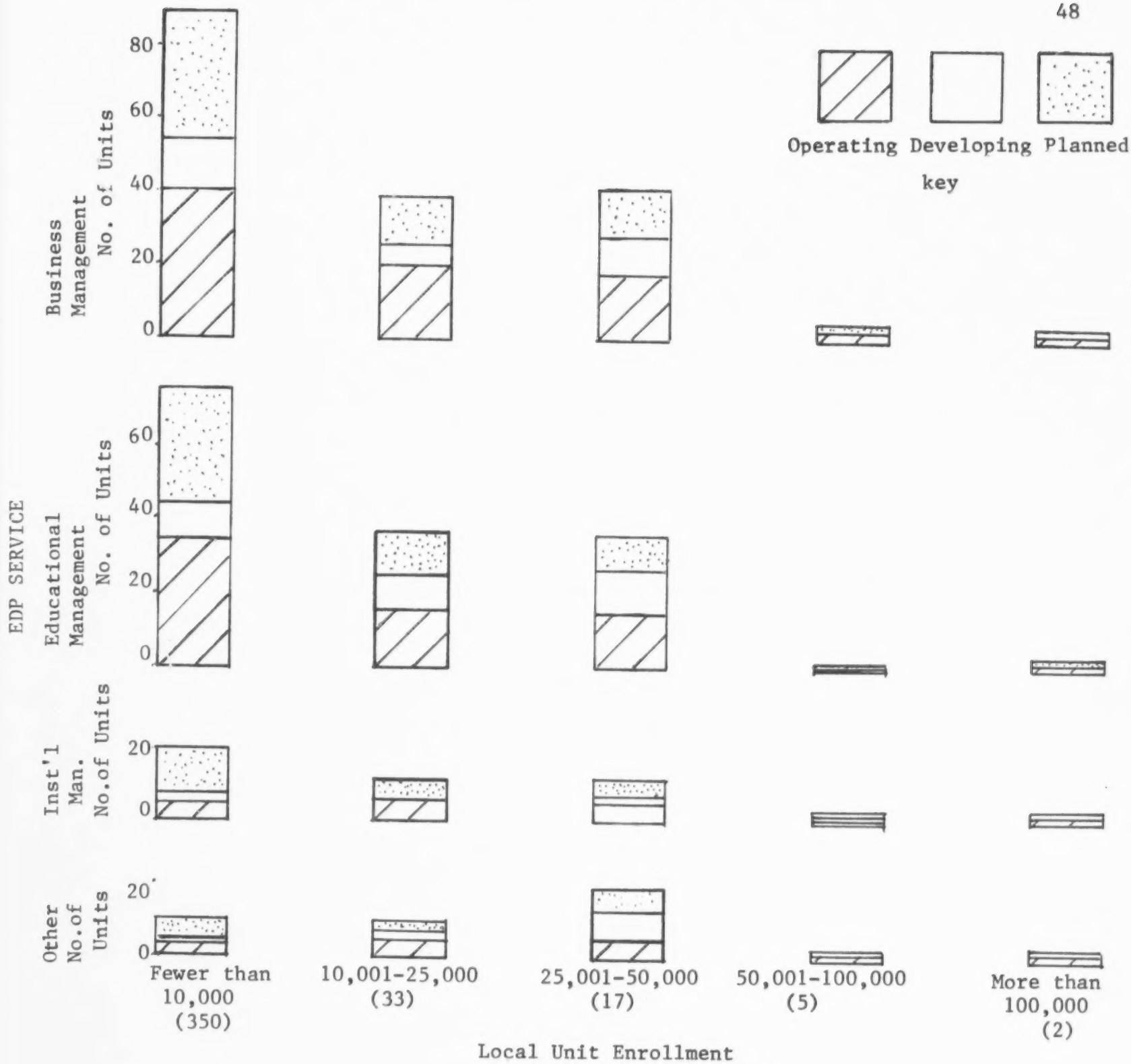

FIGURE IV

LOCAL ADMINISTRATIVE UNIT PRESENT AND PROJECTED EDP OUTPUT, BY TYPE OF SERVICE AND UNIT SIZE

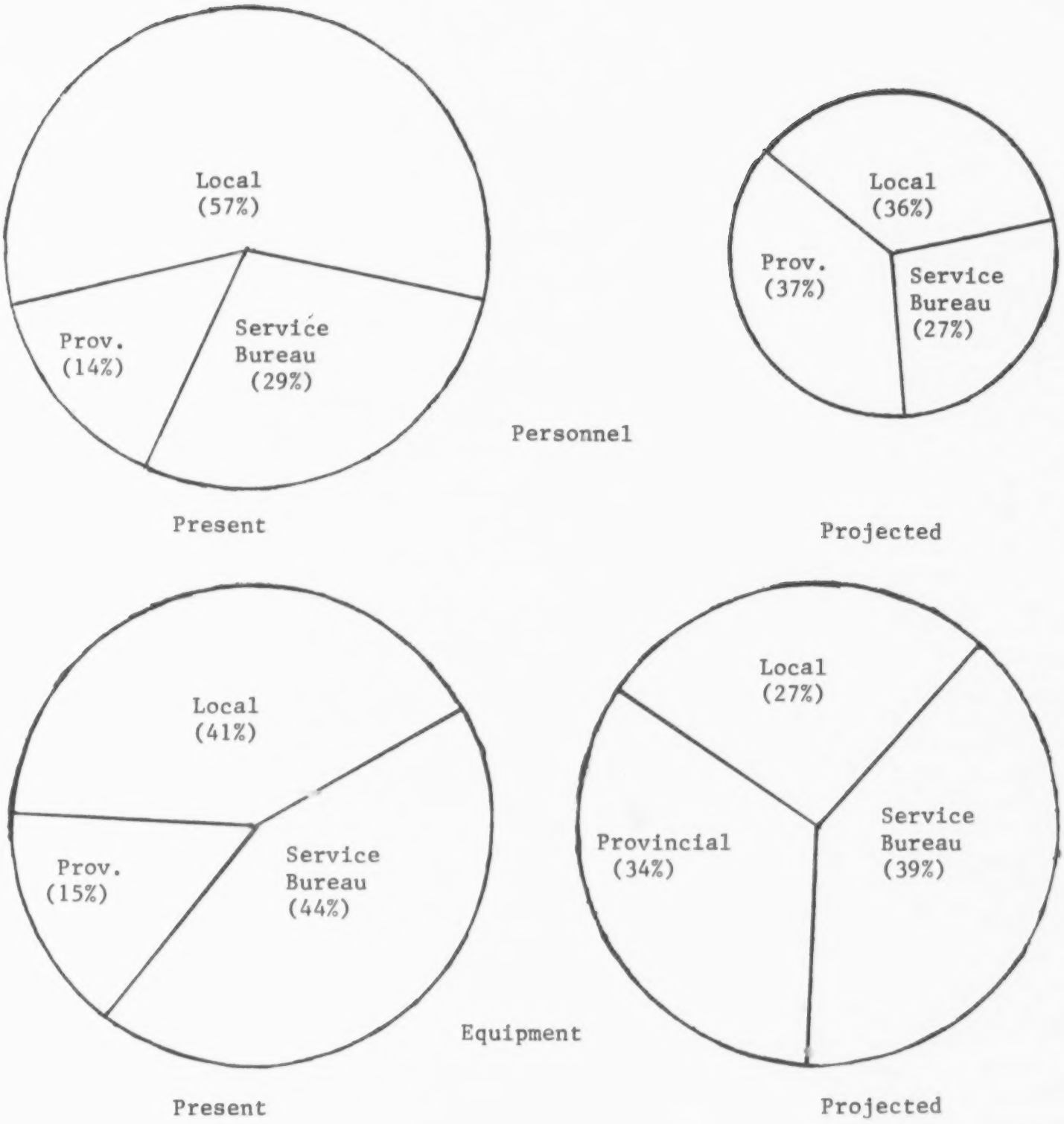

FIGURE V

PRESENT AND PROJECTED VOLUME AND TYPE
OF LOCAL UNIT EDP INPUT

(a) Output

Table XXIX indicates that the provincial Departments are proportionally more involved in development than are local units. This suggests that they may be attempting to develop the services which local units will need in the future.

This development follows the local unit trend to business and educational management services but more than matches local expectations in such other services as research and information systems.

(b) Input

Table XXX shows that provincial Departments anticipate a doubling of equipment input into EDP operations, but also indicates little planned increase in personnel input.

3. Implications

The primary trend of all these data is obvious; EDP in Canadian education is growing rapidly, perhaps exponentially. This growth is having, and will continue to have, a great impact on all those associated with education.

The major implications from the study would appear to be the following:

(a) Provincial Departments of Education must prepare for increased call on their EDP services from local administrative units. While there are some indications that provincial development is taking place in the areas local units require, the magnitude of service anticipated far outstrips the planned input at the provincial level.

If the need for EDP service at the local unit level is not fulfilled by the provincial government, services from the private sector will be sought. Although this in itself is not necessarily bad, it may well result in a topsy-like proliferation of services beyond the benefits of coordinated effort.

(b) The often called for provincial leadership in EDP seems to be emerging in the form of integrated information systems. Perhaps this is due to the efforts of the Ministers Information Services Committee (MISC) and DBS. Whatever its origin, this trend should be supported by the local school units because the benefits which will accrue from provincial coordination will far outweigh the limitations associated with some standardization of procedures.

(c) The anticipated expansion of EDP services makes the need for additional effort in producing personnel and equipment axiomatic. In secondary schools, community colleges, and universities, training programs for the full range of EDP personnel must be greatly and rapidly expanded.

Perhaps the need to educate educators to the characteristics and

TABLE XXIX

SUMMARY OF PROVINCIAL DEPARTMENT OF EDUCATION
EDP OUTPUT BY TYPE OF SERVICE
AND STAGE OF DEVELOPMENT

Service	Stage of Development			Total
	Operating	Developing	Planned	
Business Management	31	20	16	67
Educational Management	23	19	12	54
Instructional Management	5	9	4	18
Other	11	21	10	42
Total	70	69	42	181

TABLE XXX

PRESENT AND PROJECTED SUMMARY OF PROVINCIAL DEPARTMENT OF EDUCATION EDP INPUT BY TYPE

Input	Stage of Development		Total
	Present	Projected	
Personnel	41	8	49
Equipment	18	19	37

potential of EDP in their profession is of even greater import. Too few educators are involved in the development of EDP hardware and software. As a result, all too frequently the educational procedure is adapted to fit a computer program developed for business or industry rather than the reverse. What is sorely needed is a comprehensive program of development of education personnel to the ways of the computer. At the present time this program should concentrate on educational administrators, but the future will see the computer in the classroom as well. Thus, all teacher education programs must have a computer understanding and appreciation component.

(d) Finally, the most significant implication of all. Almost all of the current, developing, and planned use of the computer in Canadian education relates to administrative applications. Yet these uses are only support services to the actual educational process. Although no specific questions were asked on this topic, only one of the more than 300 questionnaires returned suggested plans for computer-assisted learning.

Those who have read Leonard's Education and Ecstacy[5] have had glimpses of the potential of the computer. Dynamic, dedicated and creative leadership is needed to transform this potential into reality.

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APPENDIX A

QUESTIONNAIRES
(copies of questionnaires available on request)

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